

Missouri Department of Transportation

# *Pursuing Excellence*

Organizational Results  
Annual Report FY 2009



Organizational Results  
Annual Report – Fiscal Year 2009  
July 1, 2008 – June 30, 2009

*Missouri Department of Transportation  
P.O. Box 270  
Jefferson City, Missouri 65109*

Contents

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*Pursuing  
Excellence*

Organizational Support .....	2-7
Innovative Solutions.....	8-13
Research .....	14-27
Highlighted Research .....	15-18
Research Reports Published.....	19-26
Research Summaries Published .....	27
Budget and Performance Data .....	28-33

## *Pursuing excellence ...*

Recently, I was enjoying some rare time at my desk when my phone rang. Instinctively, I answered, “Organizational Results, may I help you?” The voice on the other end of the phone paused for a moment, and then inquired, “Really? What kind of results can you give me?” “Excellent, of course,” I responded. That phone conversation with another state agency quickly cut to the core of what Organization Results is all about ... pursuing excellence in everything we do.

It was just four years ago that we began this novel endeavor bringing together business and engineering professionals focused on driving organizational excellence. In that short time, the Organizational Results staff has become a vital source for department managers to access the latest information, tools and resources to close performance gaps. Through partnerships with public and private sectors, Organizational Results delivers best practices and innovative solutions designed to deliver a world-class transportation experience.

Our annual report provides insight into this unique structure and our accomplishments during the past twelve months.

Respectfully submitted,

A handwritten signature in black ink, reading "Mara Campbell". The signature is fluid and cursive, with the first name "Mara" and last name "Campbell" clearly distinguishable.

Mara Campbell  
Organizational Results Director



## Organizational Support

*We seek to provide MoDOT with the tools and expert consultation to drive performance excellence.*

- ♦ *Performance analysis and consultation*
- ♦ *Performance measurement development*
- ♦ *Quality systems and tools development*
- ♦ *Process team facilitation*

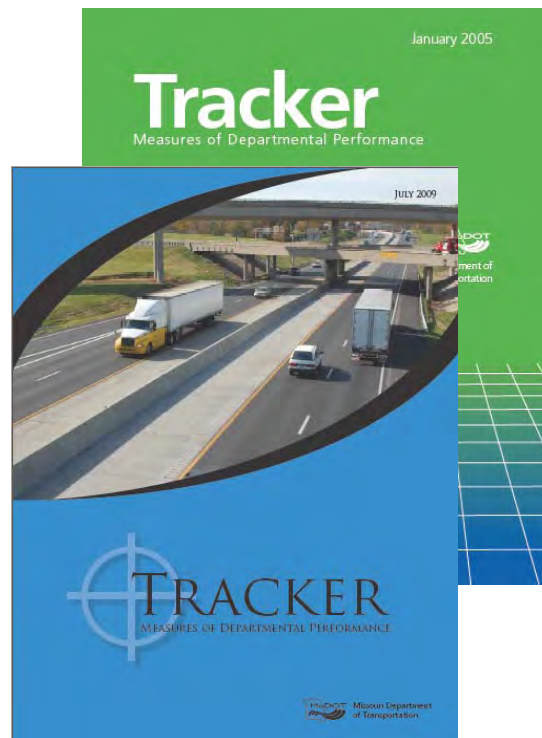
## Tracker Publication Gets Extreme Makeover

Over the last four years, the quarterly Tracker publication has become an integral part of the department's organizational landscape and management process. It's won awards, been spotlighted by national trade publications and been held as an example for all other state agencies to follow. Now thanks to a collaborative effort with professional graphic artists, MoDOT also can brag about having one of the best-looking performance publications.

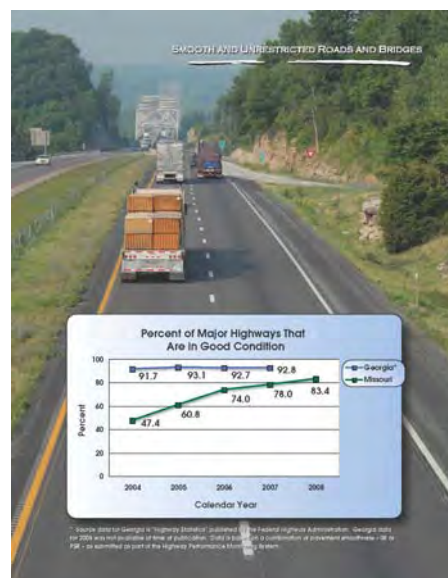
Regular readers of the Tracker publication have certainly noticed an evolution of the document. The first Tracker had 49 measures still under development, and the charts and graphs throughout the document varied greatly. It was a good first effort, but nothing that would pass a measurement driver's review now.

Since that first publication, several versions of instructions have been created to standardize reporting pages, terminology and graphs within the Tracker. Even the sequence of colors on graphs has been standardized to help make the individual reporting pages flow as a single document. However, over time standardization within a publication can create boredom for the reader. Much like a mainstream consumer magazine, at four years the publication was due an extreme makeover.

OR staff began the process in December 2008 with Community Relations graphic artists. The January 2009 edition sported a new cover design, chapter separator pages along with redesigned reporting pages. The changes were significant, but not the full retooling envisioned by staff. During the next two months, OR collaborated with an external graphic artist to take the publication to that next level.



The April 2009 Tracker introduced a fresh new look to the individual reporting pages that give the publication more of a magazine feel. The standardization is still evident, but now photos and some variety in the styles of charts add to the reader appeal. With the extreme makeover complete, OR staff has turned its attention to improving comparative and benchmark data.







### Team Strategies Boost Excess Property Sales

If you've ever tried to squeeze your mini-van or SUV into a parking space sized for a subcompact, you know firsthand the value of having enough space to get the job done. The same is true in building highways and bridges. Often extra parcels are needed to allow contractors to get the job done faster, or at times whole properties must be purchased when only a portion will be used for the project. This leaves MoDOT with property it no longer needs.

Seeing an opportunity to convert excess property into revenue for more transportation projects, the Right of Way Division chartered a team in March 2008. The group also worked on strategies to produce a more efficient realty asset management process and to integrate the disposal of excess property into MoDOT's culture.

The team's recommendations approved in June 2008, are producing some impressive numbers during fiscal year 2009. Statewide, MoDOT conveyed 228 parcels in FY 2009, which is more than double the 112 excess parcels conveyed in FY 2008. Revenue for FY 2009 from excess property

### Team Facilitation Projects *FY 2009*

- o Employee Equipment Safety
- o Letting Process Improvement
- o ADA Collaboration
- o Central Office HR Job Fill Mapping
- o Approved Products Listing Process Improvement
- o New Safety Incentive Program
- o Mowing Best Practices Process
- o Chip Seals Best Practices Process
- o OR File Management System

sales totaled nearly \$4.3 million. Those proceeds were returned to MoDOT's budget for road and bridge projects.

Team strategies included a realty asset inventory database, real estate marketing training for right of way staff, numerous process revisions to expedite sales and new performance measures to validate the importance of property sales.

## High Performance Drives Changes to Safety Incentive

When MoDOT began the Performance Plus program in 2006, the hope was to improve employee and organizational performance in several key areas. Not the least of those key areas was employee injuries.

However, the program's first success story is also its first casualty. With employee injury rates reduced by nearly 50 percent the past two years, OR led a team of district and Central Office employees to design a safety program to replace the Performance Plus Injury Reduction incentive. The team's solution was the Safety Pays program.

The Safety Pays program is designed to recognize and reward MoDOT employees for safe work behaviors. Safety Pays aims to reduce work-related injuries and associated workers' compensation costs, but most importantly, it reinforces MoDOT's highest priority, which is employee safety and well-being.

The program started July 1, 2009 and will be a stand-alone program separate from the other Performance Plus incentives. Safety Pays will be reviewed after one year to evaluate successes and failures.

In addition, the incentive program is designated to recognize the best district in the state in terms of yearlong safety. The district that achieves the lowest rate of OSHA recordables – number of incidents per 100 workers – is eligible to receive an additional \$25,000 allocation to the following year's safety budget or for equipment enhancements for safety if the rate of OSHA recordables is lower than the nation's best benchmark rate identified in Tracker measure 15f.



As of 2007, the Texas Department of Transportation was identified as the national leader with a rate of 3.03 OSHA recordable incidents per 100 workers. This incentive will only be awarded to a single district that is identified as the state winner, and will include a traveling trophy to be presented to the district engineer at the annual statewide maintenance meeting.





### Partnering Sessions Expand to Address Regional Issues

The next time you travel Interstate 270 in St. Louis without a delay, you may want to thank a new partnership among area emergency responders. The partnership to coordinate incident responses was developed at a June 15 Partnering for Innovative Efficiency meeting hosted by MoDOT's St. Louis Area District. The meeting was the first of its kind narrowed to handle a regional issue.

The June 15 meeting brought together a vested group of 40 local partners including police, highway patrol, fire, EMS and towing companies along with MoDOT staff, to discuss and identify ways to improve the coordination and communication among the partners and how to better manage incidents along Interstate 270. The group focused on the need to establish a new I-270 Corridor Incident Management Team. The partners overwhelmingly agreed that each of their communities and organizations should be involved with the team. In addition to the I-270 Team, the meeting generated close to 100 ideas, of which the group reached consensus on three other major areas of emphasis. They are:



#### Dynamic Message Boards

- More visible, eye-catching notification of incidents on message boards i.e. flashing/asterisks, etc.

#### Public Awareness and Informational Campaign

- Reduction of daily congestion
- Alternative routes
- Gateway Guide
- Getting stalled vehicles off roadways
- 511
- Traveler information

#### Increased Enforcement

- Law Enforcement
- Fines
- Photo enforcement
- New technology

The partners also discussed: recommended training for all disciplines along I-270, communication and radio inter-operability, expanded traffic video feeds, and performance measurements. The I-270 Corridor Incident Management Team will prioritize these and many of the other ideas from the meeting to begin the actions needed for implementation.



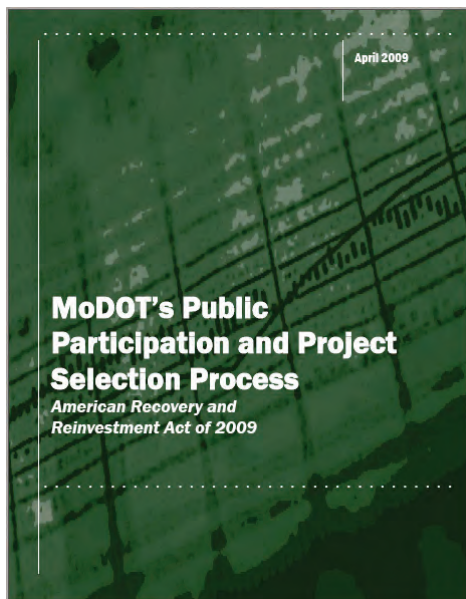
## OR Coordinates Recovery Act Reporting

Missouri was the first state in the nation to begin construction on highway projects funded by the American Recovery and Reinvestment Act. The minute President Obama signed the economic recovery bill on February 17, MoDOT went to work on four transportation projects. Additional road, bridge, air, transit, pedestrian and bicycle projects were under way in the weeks and months that followed. MoDOT's ability to put recovery dollars to work quickly was directly tied to its advance planning and the flexibility of its state transportation improvement plan.

While MoDOT was well prepared to put recovery dollars to work, the additional reporting requirements on the Recovery Act funds were a potential lug on engineering managers that needed to be focused on delivering projects on time and on budget. With a successful track record in managing large organizational programs, OR was chosen to coordinate Recovery Act reporting to external agencies and department managers.



Hours upon hours of staff work were dedicated to interpret the reporting requirements from multiple federal agencies and legislative committees collecting information on Recovery Act projects. Meetings with project data owners helped build a master-reporting calendar. Subsequent meetings with federal and legislative staff nailed down specific data and report formatting requirements. Internal meetings with department managers identified informational needs. The first weekly briefing to managers was distributed on March 13 highlighting the department's progress. The first federal report was completed on April 4 to the House Transportation and Infrastructure Committee. To provide complete transparency to the public on the use of Recovery Act funds, OR coordinated the launch of the "Ready to GO!" Website. You can review all the Recovery Act activities and reports at <http://www.modot.mo.gov/arra/index.htm>.





## *Innovative Solutions*

*Putting our research to work and taking advantage of best practices are critical to our success.*

- ♦ *Research implementation*
- ♦ *Coordination of applied technologies*
- ♦ *New products evaluation*
- ♦ *Best practice sharing*
- ♦ *Literature searches*

## **Workshop Spotlights Recycled Shingles in Asphalt**

With crude oil prices up, more than 250 percent over the past five years, the use of recycled shingles has helped keep asphalt-paving costs lower. Asphalt, like transportation fuels, is derived from crude petroleum, but represents a heavy fraction of the crude petroleum. Roofing shingles represent about one third of all construction and is demolition debris that has traditionally been placed in landfills. Asphalt pavements are fully recycled and thus the use of recycled shingles in pavements represents a "perpetual" life of shingles.

The use of post-consumer shingles, those shingles that are worn out and removed from residential homes, are being recycled and used in paving projects across the state on an increasing basis. From 2003 to 2007, MoDOT used enough recycled shingles to roof 305 houses.

Many states share common concerns and questions in the use of tear-off shingles. Previous research has allowed for only limited laboratory testing and field surveys. Researchers and bituminous/material engineers still require additional research to study the effects of tear-off recycled asphalt shingles (RAS) on the performance of hot-mix asphalt (HMA) applications and their economic value. Multiple state demonstration projects will provide adequate laboratory and field test results to more comprehensively answer the design, performance and environmental questions/concerns remaining. These concerns include the qualification of tear-off RAS for use in HMA and utilization of tear-off RAS ensuring acceptable long-term HMA performance.



As part of a national pooled fund study, MoDOT hosted a workshop in September 2008 to share its experiences with using recycled asphalt shingles in hot-mix asphalt. The two-day meeting in Joplin included presentations about quality control, mix designs, specifications and paving project tips. Nearly 150 people attended the workshop representing contractors, design consultants, federal agencies and state DOTs. You can view all the workshop presentations at: <http://www.modot.org/services/OR/RASPresentations.htm>







### Best Practices System Continues to Mature

The Solutions at Work program was started at MoDOT in November 2006 to collect, evaluate and share employee best practices throughout the organization. Solutions at Work has been successful at doing all three. During the first three years of the program, Solutions at Work received 313 employee submissions with current evaluation times averaging less than 10 days. At the same time, a total of 46 best practices have been identified and shared through an online database and periodic tip sheets. For the past two years, the annual implementation rate held at a robust 80 percent. However, fewer best practices were identified during fiscal year 2009 due to more stringent criteria, which was implemented to identify best practices with greater impact in more areas. Perhaps the most important result from the Solutions at Work program is the organizational dialogue and network of champions it has created to put innovation to work within MoDOT.

### Approved Best Practices

The following best practices were approved during this fiscal year:

- Breakaway Sign Tool
- Remote Wake-up for Computers
- Foot Pedal for Sign Truck Hydraulic Drivers
- Bridge Deck Repair Clamp
- Steel Plate Transport Trailer
- String Trimmer Fix
- Guardrail Pusher
- Hitch-Haul Ramp
- Mud Jack Pipe
- Employee Concerns Database

**District 9 Employee Advisory Extension Council**  
**Employee Concern Form**  
Date: 08/19/2009

The D9 EAEC will make every effort to discuss and answer your concern within 30-45 days; however, some issues may take longer for which to find answers. If the answer to your concern is beneficial to our district, and NOT confidential, it may be posted on the D9 EAEC web page.

First Name:  Last Name:

Your name is optional, but if you choose to submit your name, the answer will be given directly to you.

Department/Location:

Concern:

When you click "Submit" the information will go directly to our D9EAEC Team Leader Mary Jane Bruning. Thank you for your concern.



## Tool and Equipment Showcase Combines with Spring Maintenance Meeting

MoDOT's customers have come to expect innovative transportation solutions ... and MoDOT employees delivered at the second Tool and Equipment Innovation Showcase March 31 in Springfield. The showcase, which was held in conjunction with the spring statewide maintenance meeting, brought together 25 district tool and equipment innovations in the areas of roadsides, pavement marking and bridge maintenance.

A team of technical experts, including an evaluator from each district, rated innovations on overall cost effectiveness, ease of use, versatility and the ability to implement statewide. Five individual winners would take home \$500 for themselves and an extra \$10,000 for their district budget. Winners at 2009 Tool and Equipment Innovation Showcase included:

### **Roadside Tools**

**First Place** - String Trimmer Fix uses 20 cents in hardware to save nearly \$30 per string trimmer repair.

### **Roadside Equipment**

**First Place** - Guardrail Pusher reduces the time and eliminates chemicals needed to manage excess aggregate and vegetation around guardrails.

**Honorable Mention** - Pogo Stick Hose Holder reduces downtime and repair costs on tractor hoses.

### **Pavement Marking Equipment**

**First Place** - Hitch-Haul Ramp improves safety by eliminating the need to lift items in and out of the truck bed.

**Honorable Mention** - Nurse Truck Trailers eliminate the need for a second nurse truck and refilling the striping on the side of the road.



### **Bridge Maintenance Tools**

**First Place** - Bridge Deck Repair Clamp eliminates the need for erecting time consuming scaffolding.

**Honorable Mention** - Mud Jack Pipe saves time and wasted materials raising pavements on bridge approaches.

### **Bridge Maintenance Equipment**

**First Place** - Steel Plate Transport Trailer places temporary steel plates with just one person and a pickup truck. Normal installations require a three-person team, a front-loader and a dump truck.

**Honorable Mention** - Bridge Deck Sealer System reduces the number of employees needed to seal bridge decks.

Details on winning innovations will be shared statewide for implementation. Employees will be able to access information on all 25 displays at the Tool and Equipment Web page.

# Innovative Solutions Summaries Published

Full research summaries can be found at:

<http://www.modot.mo.gov/services/OR/byDate.htm>



## AVSAL: Costs and Benefits, Two Systems Compared

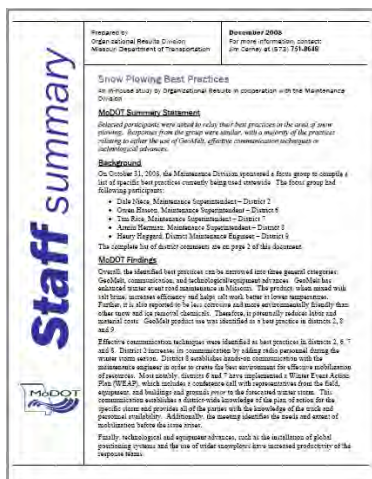
### Project Purpose:

The objective of this in-house study was to evaluate Automatic Vehicle Status and Location systems for use on MoDOT vehicles and specifically compare two systems for purchase. With similar performance by both systems, software modifications to accept data from either system were recommended.

## Cold In-Place Recycled Asphalt Tested on Low-Volume Routes in Northwest District

### Project Purpose:

With continually rising oil prices and the expense of prepping the road prior to an HMA overlay, the Northwest District sought out a cheaper way of rehabilitating these pavements. The alternative they chose was a Cold In-Place Recycled (CIR) Asphalt Overlay. Field performance data is continuing to be collected.



## Snow Plowing Best Practices

### Project Purpose:

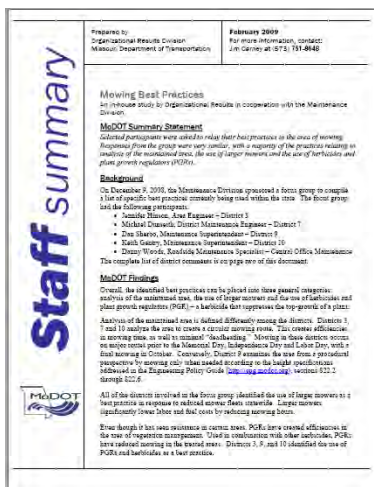
A focus group of select participants was asked to relay best practices in the area of snow plowing. Responses from the group were similar, with a majority of the practices relating to either the use of GeoMelt, effective communication techniques or technological advances.

## Innovative Solutions Summaries Published (cont'd.)

### Mowing Changes Pay Big Returns for Southwest District

#### Project Purpose:

The complete revision of the mowing practices and fleet management in MoDOT's Southwest District validates that analysis, planning, determination, commitment and focus can produce efficiencies. For its efforts, the district has seen a dramatic reduction in labor and fleet expenditures, increased customer satisfaction, and improved employee morale.



### Mowing Best Practices

#### Project Purpose:

A focus group of select participants was asked to relay best practices in the area of mowing. Responses from the group were very similar, with a majority of the practices relating to analysis of the maintained area, the use of larger mowers and the use of herbicides and plant growth regulators (PGRs).

### Missouri Leads the Way in Optimizing Snow Removal

#### Project Purpose:

With 34 TowPlows now in its fleet, the Missouri Department of Transportation leads the nation in wide plowing technology. During winter storms in Missouri, 34 specially trained MoDOT snowplow drivers do the work of at least 68 drivers in 68 trucks.





## Research

*Our business and engineering research program is targeted to have the greatest impact on delivering a world-class transportation experience.*

- ♦ Administration of research contracts with public and private organizations
- ♦ Coordination of multi-state research projects
- ♦ Management of in-house research activities



## Highlighted Research

RI06-043/TR090643

### Benefit-Cost Evaluation of MoDOT's Total Striping and Delineation Program

In 2006, the Missouri Department of Transportation completed a major program, known as the Smooth Roads Initiative, which improved both the rideability and the visibility of more than 2,300 miles of major roadways in Missouri. The SRI program included most of the Interstate system in Missouri plus freeways and expressways and some multilane and two-lane undivided roads. The striping and delineation improvements in the SRI program included:

- Wider and higher-visibility lane lines,
- Wider edgelines with rumble strips or shoulder rumble strips,
- Centerline rumble strips (*on undivided highways only*),
- Roadside barrier (*guardrail*) improvements,
- Barrier-mounted delineators (*on concrete barriers, guardrails, and cable barriers*), and emergency reference marker signs (*on Interstate highways only*).

The objectives of this research were to:

- Evaluate the safety effectiveness of SRI improvements (*including specific combinations of improvement types*),
- Perform a benefit-cost evaluation using the safety evaluation results together with improvement cost data, and
- Assess public perception or satisfaction with improved striping and delineation.

**Principal Investigator(s):**  
Midwest Research Institute

**Total Amount Expended:**  
\$50,000



**State and Regional Value:** Based on the results from this research, MoDOT can confidently proceed with future striping and delineation improvements knowing that such improvements make a substantial contribution to safety and that they are well received by the motoring public. Significant findings from the study included:

- Fatal and disabling injury accidents were reduced by 8 percent on SRI routes.
- Missouri received an estimated \$9.70 in benefits for every dollar spent.
- Wider stripes combined with both centerline and edgeline rumble strips on resurfaced rural two-lane highways provided a benefit-cost ratio of 59.
- There were significant reductions in nighttime fatal and disabling injury crashes (ranging from 25 to 77 percent) for rural freeways, rural multilane divided highways, and rural two-lane highways.
- A survey of Missouri motorists indicated that 79 percent believe the improvements have been a good investment of taxpayer dollars and 80 percent indicated MoDOT should implement similar improvements more widely in the future.

**Find the full report at:**

<http://www.modot.mo.gov/services/OR/byDate.htm>

## Highlighted Research

RI07-036/TR090736

### Low-Flow Water Study for Missouri



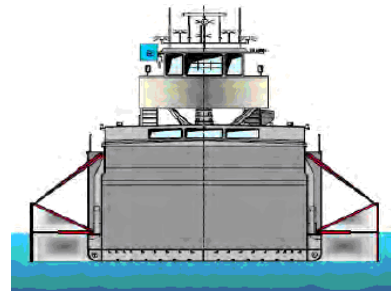
Low river depths and reduced navigational seasons have significantly reduced barge traffic on the Missouri River. However, that could be changing thanks to a recent feasibility study of low-flow technology. Low-draft barges may soon be revitalizing the barge industry on the Missouri River. The Missouri Department of Transportation conducted a research study to identify and review low-flow industry trends, equipment and strategies used in inland navigation settings throughout the United States and worldwide which may be transferable to the Missouri River and which could support an increase in barge activity on the Missouri River. Study objectives included:

- Low-Flow Issues of the Missouri River – an evaluation of current challenges faced by tugs and barges operating on the Missouri River.
- Interview Survey – a survey to determine challenges of moving cargo on the Missouri River and potential solutions to support expansion of cargo activity. Organizations interviewed include shippers of cargo, terminal operators, tug and barge operators, and government agencies.
- Market Analysis and Trends – a review of historical trends in cargo activity on the Missouri River and developments in the barge industry.
- Best Practice Identification – an evaluation of low-flow technologies used on other river systems in the U.S. and Europe.

- Potential Technology Solutions – based on the interview survey and technology evaluation, the identification of potential solutions that could support cargo activity on the Missouri River.
- Public Sector Benefits and Costs – proposed policy actions for MoDOT, and their impacts.

**State and Regional Value:** Research on Missouri River navigational conditions has identified competing opinions from stakeholder groups. Today it seems the demands of environmentalists and their concern for endangered species outweighs the demand for river transportation. Private interests maintain the timing of upstream dam releases do not fit with tourist or fishing seasons and impact potential development to support those industries. Research on existing and proposed technologies and operating practices on low-flow rivers identified barge light loading is an acceptable practice although its use restricts expansion of river traffic and cargo volumes on the Missouri River. In addition, a shallow draft tug with a maximum draft of six feet could operate at under minimum service flow conditions throughout the Missouri River's regular navigational season.

This research has been utilized many times for outreach efforts for stakeholders in providing information and direction for the state of Missouri.



**Find the full report at:**

<http://www.modot.mo.gov/services/OR/byDate.htm>

**Principal Investigator(s):**

TranSystems Corporation

**Total Amount Expended:**

\$79,796

## Highlighted Research

RI07-042/TR090742

### Quick Test for Durability Factor Estimation

Proposed changes in the Missouri Department of Transportation concrete pavement acceptance specifications are end-result in nature. It has been proposed that concrete will be accepted, in part, on the results of the Durability Factor (AASHTO T 161) determination from paving concrete sampled on-site. Unfortunately, the T 161 test duration is quite lengthy (75 days or more), and results may lag construction progress so much that mid-course corrections would be impossible to achieve in a timely manner. Miles of out-of-specification concrete could be placed and go undetected for several months. Thus, it would be useful to have a quicker answer. This would be especially useful if the Durability Factor (DF) ever became a Quality Level Analysis (QLA) pay factor. The solution could be achieved by being able to establish an approximation of DF within a short time after sampling aggregates. The approximation of DF would alert the construction inspector that concrete might have durability problems.

Researchers at the Missouri University of Science and Technology proposed to MoDOT, an evaluation system that would estimate DF in a timelier manner. It was envisioned that the system could take one of several forms, including a predictive regression equation(s) or a system of threshold limits.

**State and Regional Value:** Multiple linear regressions were developed to produce seven models of varying accuracy and complexity for DF prediction. Historical T 161 DF data for the same aggregate materials (different samples) were used as the dependent variable. Some

**Principal Investigator(s):**  
Missouri University of Science and  
Technology

**Total Amount Expended:**  
\$59,997



models entailed test methods not normally performed by MoDOT, such as vacuum saturated bulk specific gravity, wet ball mill, aggregate crushing value, and point load strength. Other models included 28-day concrete compressive strength. Less accurate models contained more familiar test methods, such as gradation, bulk specific gravity, sodium sulfate soundness, Micro-Deval, and Iowa Pore Index. The R squared values of the models ranged from 0.804 to 0.974.

Seven options were presented to MoDOT for consideration. As an alternate to the regression models, an evaluation method using threshold limits is being considered. A validation of the research is being conducted during the construction year.



**Find the full report at:**

<http://www.modot.mo.gov/services/OR/byDate.htm>

## Highlighted Research

RI07-053/TR090753

### Early Permeability Test for Asphalt Acceptance



The Missouri Department of Transportation is moving toward end-result specifications in which the contractor has more responsibility in mix designs, but the materials must pass certain tests. Currently MoDOT determines acceptance of asphalt pavement based on coring and testing that takes time and creates a destructive element in new asphalt pavement. In 2006, MoDOT staff performed preliminary permeability testing on several asphalt pavements to investigate the possibility of a nondestructive test method to determine a quicker and non-destructive method to accept asphalt pavements. Their findings appeared promising. Project RI07-053 was developed to find a test or set of tests that can be performed to determine the acceptance of asphalt mixtures. These nondestructive tests could alert the construction inspector when asphalt pavement might have performance issues long before the current acceptance methods.

During the study, three methods of permeability testing were identified as viable. Two of the devices, a Kentucky Air Permeameter and an NCAT Permeameter, are field test devices that can be used on recently placed pavements. The third device, a Karol-Warner Permeameter, can be used to test field cores or laboratory prepared samples.

The Kentucky and NCAT Permeameters were preferred for implementation over the Karol-Warner Permeameter as test results can be obtained on in-situ pavements and the results known in the same day the pavement is placed. However, the NCAT Permeameter was preferred over the Kentucky Air Permeameter because the NCAT unit is readily available commercially and was found simpler in its operation. The availability of equipment, ease of use and timeliness of test results, make the NCAT Permeameter MoDOT's recommendation for non-destructive testing of asphalt permeability.

**State and Regional Value:** The research for this project generated the following deliverables:

- Specification for permeability testing using an NCAT Permeameter as part of the Missouri Department of Transportation' construction quality control quality assurance testing utilizing percent within limit specifications;
- Test criteria/method for permeability using a Karol-Warner Permeameter as part of the mix design evaluation process;
- The test equipment for conducting permeability testing utilizing, namely an NCAT Permeameter, a Karol-Warner Permeameter, and a ROMUS Air Permeameter; and
- Training module for conducting permeability testing utilizing an NCAT Permeameter and a Karol-Warner Permeameter.

**Find the full report at:**

<http://www.modot.mo.gov/services/OR/byDate.htm>

**Principal Investigator(s):**

Iowa State University

**Total Amount Expended:**

\$71,175



## Research Reports Published

Full reports can be found at:

<http://www.modot.mo.gov/services/OR/byDate.htm>

**RI07-009/TR080709**

### **Analysis of MoDOT Communication and Outreach Effectiveness**

**Principal Investigator:**

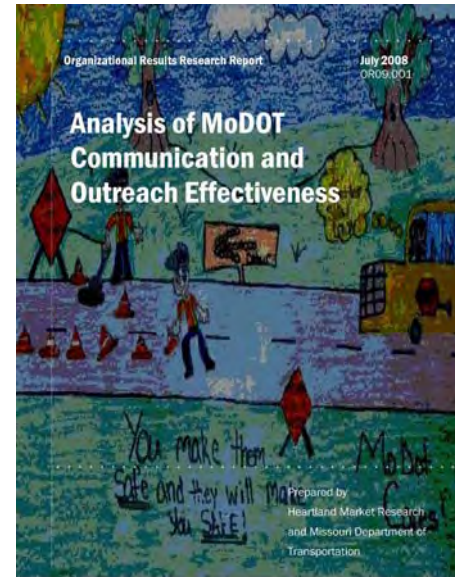
Heartland Market Research

**Total Amount Expended:**

\$111,126 (no FY2009 expenditures.)

**Project Purpose:**

This study assessed MoDOT's current internal and external communication practices and customer segmentation. Based upon the interview findings and the criteria for a good segmentation scheme, discussed within the report, five key segments were developed: General Public, Engaged Public, Media, Public Officials & Organizations, and Private Organizations (Non Media). Based upon this research, the overall finding was that MoDOT's communication effectiveness is good.



**RI07-007/TR080707**

### **Customer Satisfaction: Survey of Missouri Adults**

**Principal Investigator:**

Abacus Associates, Inc.

**Total Amount Expended:**

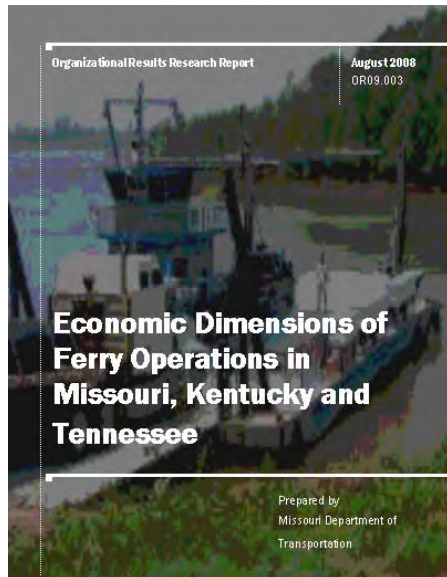
\$53,678 (no FY2009 expenditures.)

**Project Purpose:**

This survey populates data for five customer satisfaction measures for the MoDOT Tracker. The survey also asks other evaluative and priority questions that measure the public's support for various ways of raising and appropriating revenue for transportation. A professional calling center was contracted to obtain a representative sample of each of the 10 MoDOT districts, with a minimum of 350 respondents per district.



### Research Reports Published (cont'd.)



**RD09-003/TR090903**

#### **Economic Dimensions of Ferry Operations in Missouri, Kentucky and Tennessee**

**Principal Investigator:**

Missouri Department of Transportation

**Total Amount Expended:**

In-house

**Project Purpose:**

This analysis considered the economic dimensions of the Dorena-Hickman ferry for a three-state region that included Missouri, Tennessee and Kentucky. While flooding and decreased revenues have hampered the cost effectiveness of the Dorena-Hickman ferry operation, it continues to be an important and unique amenity for this three state region.

**RI07-036/TR090736**

#### **Low-Flow Water Study for the Missouri River**

**Principal Investigator:**

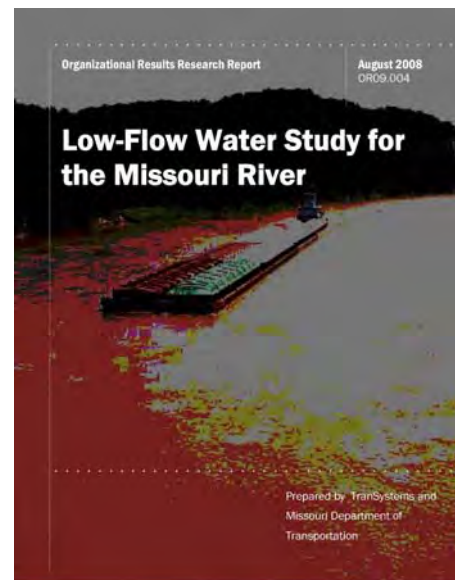
TranSystems Corporation

**Total Amount Expended:**

\$79,796

**Project Purpose:**

This feasibility study of low-flow technology identified and reviewed low-flow industry trends, equipment and strategies used in inland navigation settings throughout the United States and worldwide which might be transferable to the Missouri River and which could support an increase in barge activity on the Missouri River.



## Research Reports Published (cont'd.)

**RI07-043/TR090743**

### **Alternative Fuel (E-85) Performance, Economics, Quality and Usage**

**Principal Investigator:**

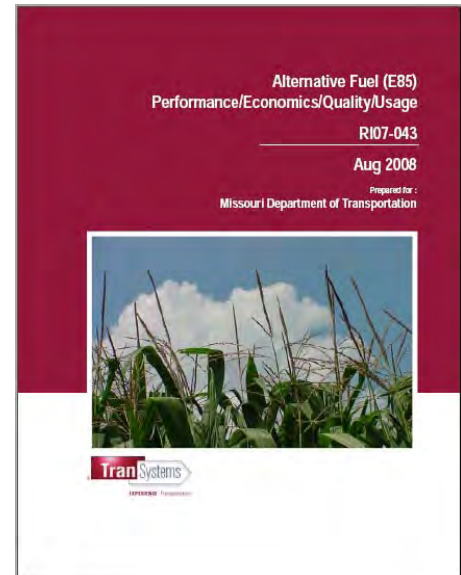
TranSystems Corporation

**Total Amount Expended:**

\$14,501

**Project Purpose:**

This study provided an overview of the E-85 product to reveal performance experience of flex fuel vehicles (FFV) using E-85 as well as the potential environmental benefits. Applying these findings to the FFV fleet within the Missouri Department of Transportation's fleet produced quantifiable measures to be considered during policy development. The implications of E-85 use presented in this study lay the foundation for strategic fleet management.



**RI02-022/TR090222**

### **Preservation of Missouri Transportation Infrastructure: Validation of FRP Composite Technology**

**Principal Investigator:**

Missouri University of Science and Technology

**Total Amount Expended:**

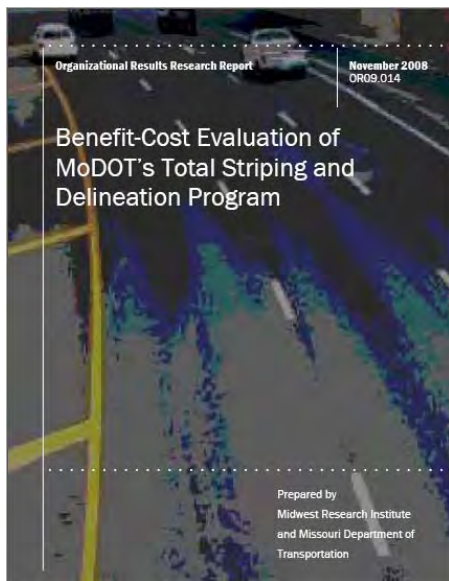
\$1,133,468

**Project Purpose:**

This study was designed to push forward composite strengthening schemes for use on real structures. Using real structures demanded that the strengthened structures be monitored for performance to prove that the composites were working and that they were not losing strength over time. Monitoring the structures meant scheduling load tests for all five bridges. Difficulties in using traditional monitoring equipment, like Linear Variable Displacement Transducer systems, on these structures ordered the search for a better monitoring system. Five individual reports were published.



### Research Reports Published (cont'd.)



**RI06-043/TR090643**

#### **Benefit-Cost Evaluation of MoDOT's Total Striping and Delineation Program**

**Principal Investigator:**

Midwest Research Institute

**Total Amount Expended:**

\$50,000

**Project Purpose:**

The objectives of this research were to 1) evaluate the safety effectiveness of SRI improvements (including specific combinations of improvement types), 2) perform a benefit-cost evaluation using the safety evaluation results together with improvement cost data, and 3) assess public perception or satisfaction with improved striping and delineation.

**RI08-021/TR090821**

#### **Resilient Moduli of Granular Base Materials Using Modified Type 5 Gradation**

**Principal Investigator:**

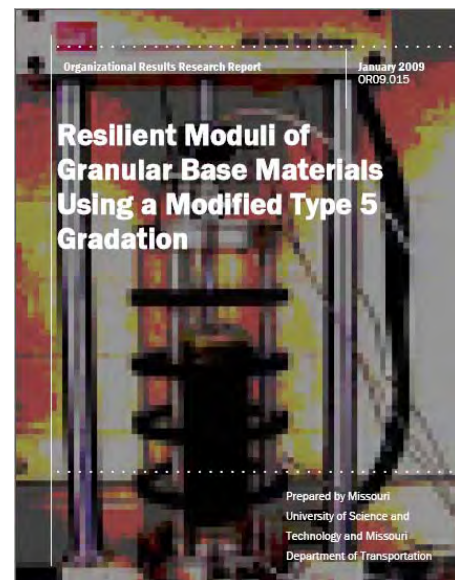
Missouri University of Science and Technology

**Total Amount Expended:**

\$7,434

**Project Purpose:**

This project investigated a proposed specification change for Type 5 gradations. The rationale for this proposed change was that some aggregate producers believed the change could help lower their costs of producing a Type 5 aggregate base material. While the proposed change was found to produce a more drainable base aggregate, some constructability issues were discovered.





## Research Reports Published in (cont'd.)

**RI06-001/TR080601**

### **Resilient Moduli of Typical Missouri Soils and Unbound Granular Base Materials**

**Principal Investigator:**

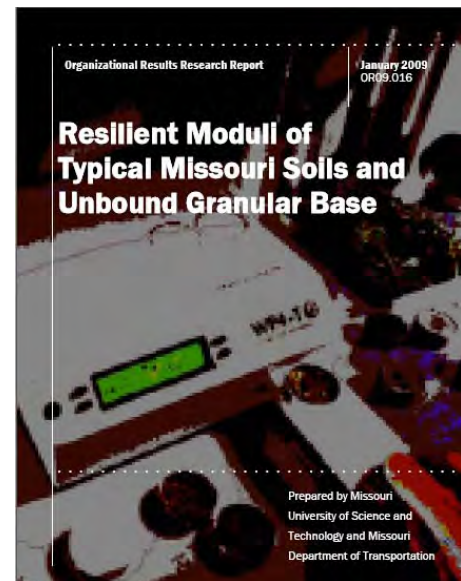
Missouri University of Science and Technology

**Total Amount Expended:**

\$92,771 (*no FY2009 expenditures*)

**Project Purpose:**

The objective of this project was to determine the resilient moduli for common Missouri subgrade soils and typical unbound granular base materials in accordance with the AASHTO T 307 test method. The results allow Missouri Department of Transportation pavement engineers to calibrate software included with the National Cooperative Highway Research Program Project 1-37A Mechanistic-Empirical Pavement Design Guide according to Missouri's conditions and materials.



**RI07-057 /TR090753**

### **Early Permeability Test for Asphalt Acceptance**

**Principal Investigator:**

Iowa State University

**Total Amount Expended:**

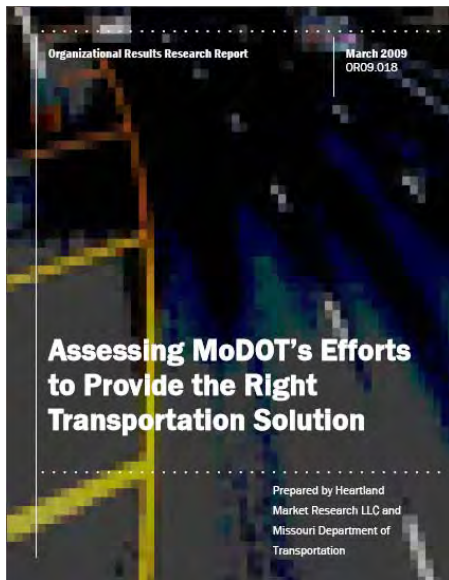
\$71,175

**Project Purpose:**

This study identified the nominal maximum aggregate size, the theoretical maximum specific gravity of the mixture, and thickness of the pavement or core as statistically important factors influencing permeability and air voids. Three methods of permeability testing were identified as viable: the Kentucky Air Permeameter, the Karol-Warner Permeameter, and the NCAT Permeameter.



### Research Reports Published (cont'd.)



**RI08-017/TR090817**

#### **Assessing MoDOT's Efforts to Provide the Right Transportation Solutions**

**Principal Investigator:**

Heartland Market Research

**Total Amount Expended:**

\$36,000

**Project Purpose:**

The basic research design for the project was to sample opinions on a variety of projects spread across the state. When available, a small, medium, and large project from each of the 10 MoDOT districts was selected by a regional manager for the project for a total of 30 projects. Each survey was focused on one of 30 individual projects, which was briefly described on the survey, and the majority of survey questions related to the recently completed project, such as determining if the completion of the project increased safety, convenience, and made it easier to drive.

**RI07-002/TR090702**

#### **Remote Health Monitoring for Asset Management**

**Principal Investigator:**

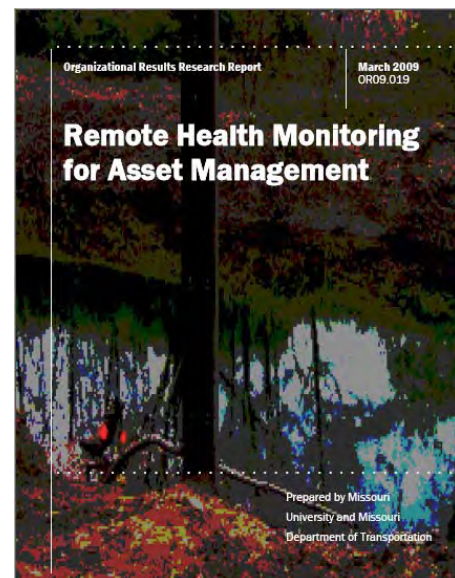
University of Missouri-Columbia

**Total Amount Expended:**

\$14,920

**Project Purpose:**

This project investigated the development of an instrumented pile that could provide real-time data on bridge scour, allowing for the remote monitoring of bridge conditions by key managers and engineers. The developed technology has the potential to identify hazardous conditions at a bridge site, such that managers and owners can be notified automatically and appropriate actions can be undertaken.



## Research Reports Published (cont'd.)

**RI07-042/TR090742**

### **Quick Test for Durability Factor Estimation**

**Principal Investigator:**

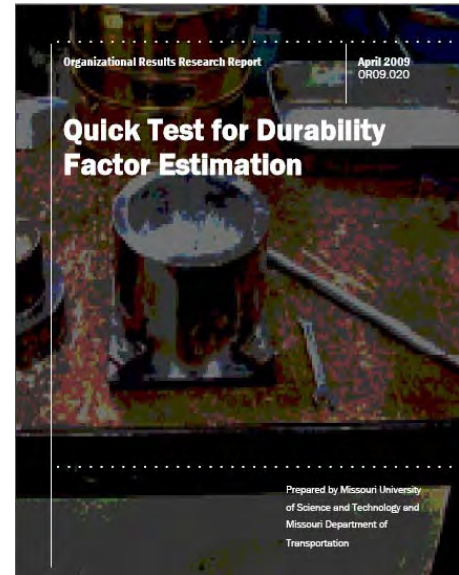
Missouri University of Science and Technology

**Total Amount Expended:**

\$59,279

**Project Purpose:**

This objective of this research was to develop a method of approximation of Durability Factor (DF) based primarily on aggregate testing that would be of a shorter duration. The approximation of DF could alert the construction inspector that concrete might have durability problems. Seven options were presented to MoDOT for consideration. As an alternate to the regression models, an evaluation method using threshold limits is being considered. A validation of the research is being conducted during the construction year.



**RI07-041 /TR090741**

### **Quality Assessment and Verification of the State of Missouri's Archaeological Sites Geodatabase**

**Principal Investigator:**

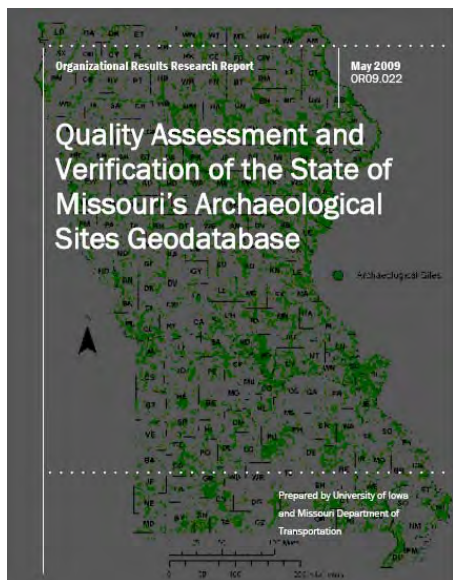
Missouri University of Science and Technology

**Total Amount Expended:**

\$74,913

**Project Purpose:**

This project provided a thorough quality control/quality assessment (QA/QC) by professional archeologists of MoDOT's Geographic Information System (GIS) geodatabase of archaeological sites and surveys required to ensure its accuracy for use in project scoping and development activities. The University of Iowa Office of the State Archaeologist conducted the QA/QC for the geodatabase including initial validation and verification of a sample of counties, and recommendations for completing the remaining 99 counties.





### Research Reports Published (cont'd.)



**RI07-044/TR090744**

#### **Impacts of Public Policy on Safety – Graduated Driver's License**

**Principal Investigator:**

University of Missouri-Kansas City

**Total Amount Expended:**

\$43,611

**Project Purpose:**

This study evaluated the effectiveness of Missouri's GDL policy. This study found a substantial decrease in crash involvement rates among drivers aged 16-18 in Missouri while drivers aged 19 or older have a moderate decrease in the rates. This study also found Missouri teenage drivers aged 16-18 had a small but steady decrease in their fatality rates while the drivers in neighboring states with weaker GDL provisions experienced either an increase or fluctuation.

**RD09-025/TA090925**

#### **Columbia Terminal Railroad (COLT) Feasibility Analysis**

**Principal Investigator:**

Missouri Department of Transportation

**Total Amount Expended:**

In-house

**Project Purpose:**

The objective of this research was to determine the expansion feasibility of intermodal freight movement through the Columbia Terminal Railroad (COLT) in Central Missouri. Businesses and shippers were surveyed to determine feasibility. Over half of the survey respondents indicated interest in COLT services. Recommendations for implementation include marketing, business development, intermodal development and public / private partnership development.





## Research Summaries Published

Full research summaries can be found at:  
<http://www.modot.mo.gov/services/OR/byDate.htm>



RI08-040/TR090840

### The Economic Value of Investment in Freight Transportation: Missouri Ports

#### Principal Investigator:

Missouri Economic Research and Information Center

#### Total Amount Expended:

\$9,000

#### Project Purpose:

The objective of the Missouri ports report was to assess the economic value of approximately \$6.65 million of investment in four port projects authorized for 2009. The project also used two case studies to demonstrate the benefits of port investments.

RI08-041/TR090841

### The Economic Value of Investment in Freight Transportation: Missouri Highways

#### Principal Investigator:

Missouri Economic Research and Information Center

#### Total Amount Expended:

\$2,000

#### Project Purpose:

The objective of the "Missouri Freight Transportation - Highways Report" was to assess the economic value of the 2009-2013 STIP investments in terms of the freight trucking industry. The report also provided a baseline impact of the trucking industry.



RD09-020/TR090920

### Roller Compacted Concrete

#### Principal Investigator:

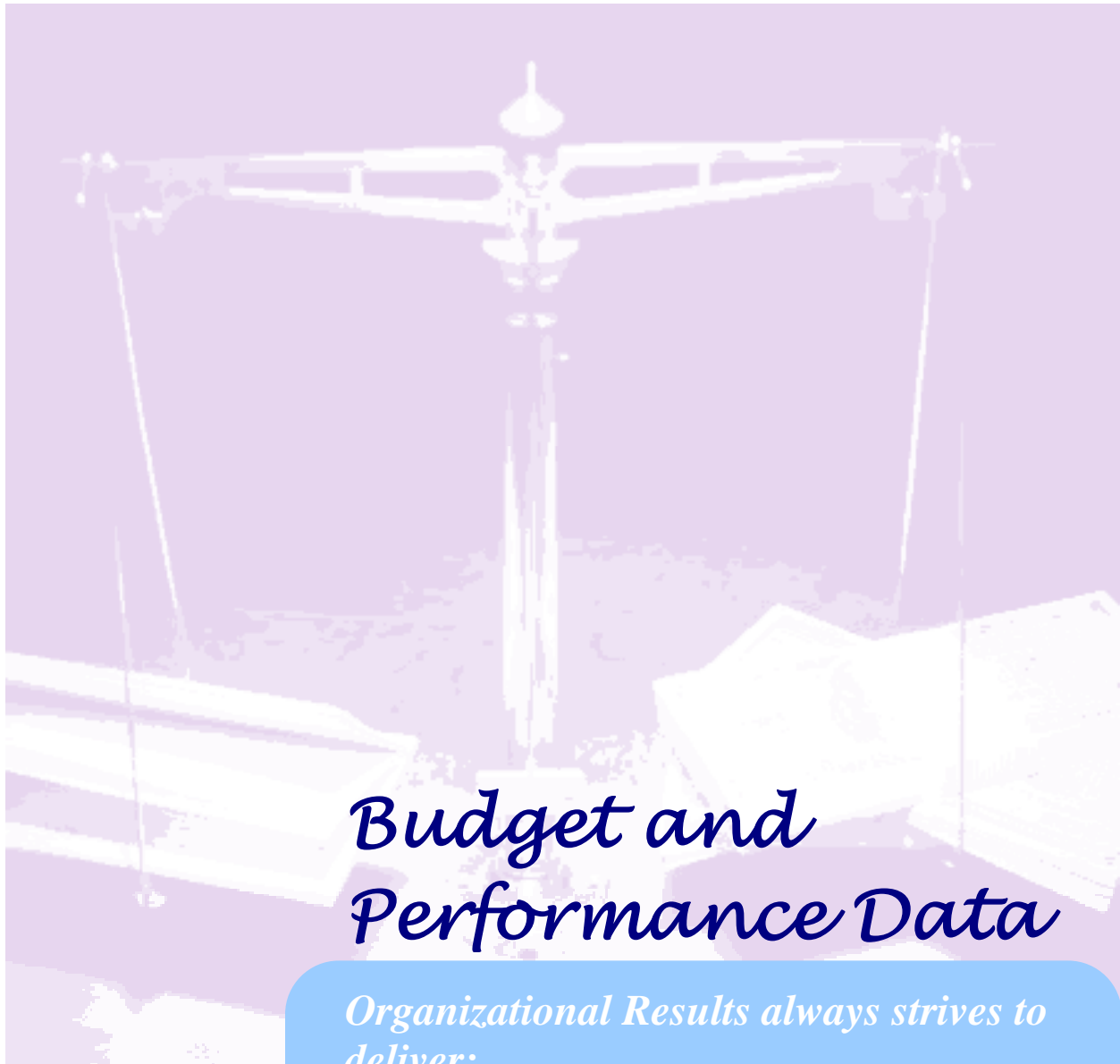
Missouri Department of Transportation

#### Total Amount Expended:

In-house

#### Project Purpose:

The objective of this research was to determine if roller compacted concrete (RCC) is a viable option for roadway overlays. Traditional concrete overlays can take weeks to cure; RCC possibly could be opened to traffic after 24 hours. However uses to this point have been parking lots and shoulders.

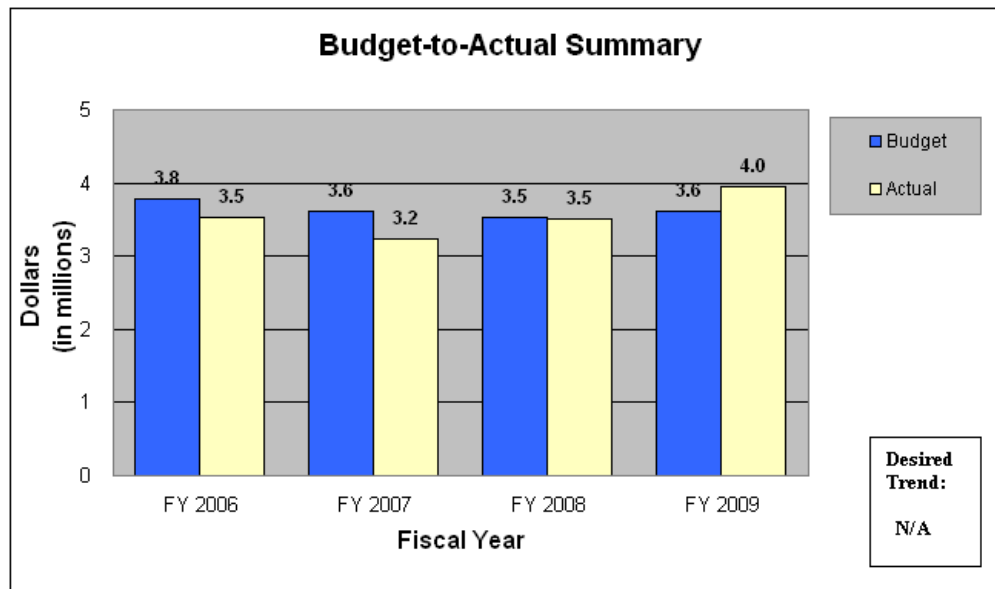


## *Budget and Performance Data*

*Organizational Results always strives to deliver:*

- ♦ *The best value for every dollar spent,*
- ♦ *Innovative transportation solutions, and*
- ♦ *Fast projects that are of great value.*

## Budget-to-Actual Summary



Organizational Results' approved budget for fiscal year 2009 was \$3,607,920\*, which was slightly more than the FY 2008 budget of \$3,520,586, but below the FY 2007 budget of \$3,616,538. Of the total FY 2009 budget amount, \$1,486,012 was budgeted for personal services and fringe benefits, and \$2,121,908 was budgeted for E&E. Total expenditures through the fourth quarter of FY 2009 totaled \$3,954,472.14. This is higher than \$3,507,162.21, experienced during FY 2008. Excluding benefits, expenditures were over budget by 7.3% as result of project timing.

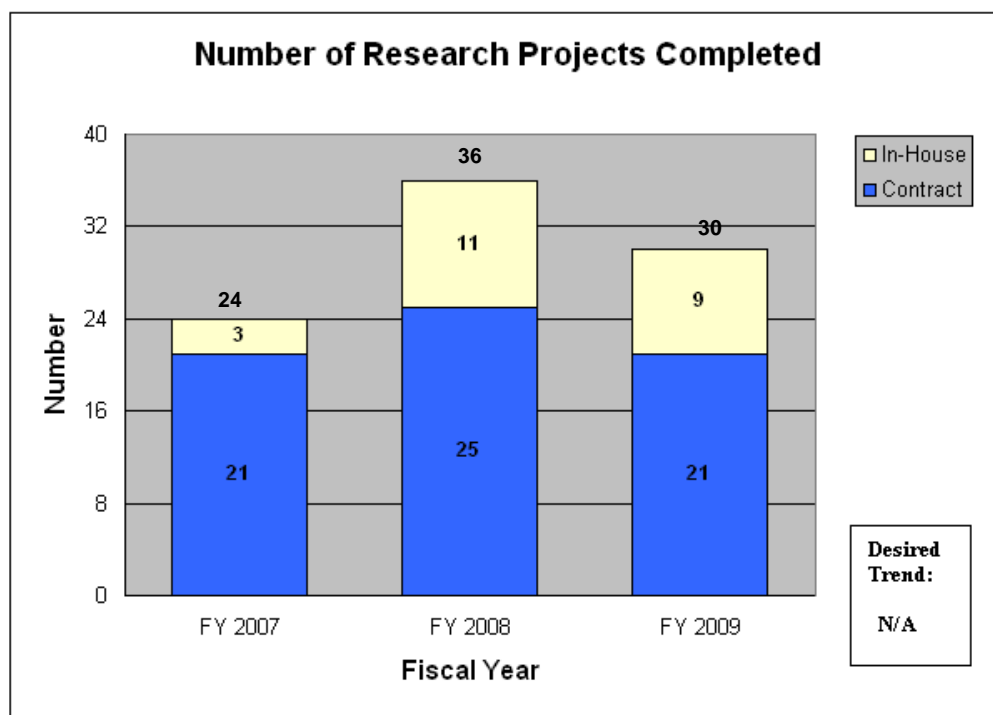
\*OR FY 2009 budget was increased by \$10,000 for personal services, which is not reflected in the SPR budget.

## SPR FY 2009 Budget Summary

	<u>Budget Amount</u>	<u>Expenditures</u>	<u>Percent Expended</u>
Administration	\$540,752	\$750,252	138.74%
Research	\$2,107,361	\$2,094,679	99.40%
Development	\$72,309	\$87,642	121.20%
Technology Transfer	<u>\$280,000</u>	<u>\$387,174</u>	<u>138.28%</u>
Part II Total	\$3,000,422	\$3,319,747	110.64%
Part 1 Total	<u>\$597,498</u>	<u>\$634,725</u>	<u>106.23%</u>
Grand Total	<b>\$3,597,920</b>	<b>\$3,954,472</b>	<b>109.91%</b>

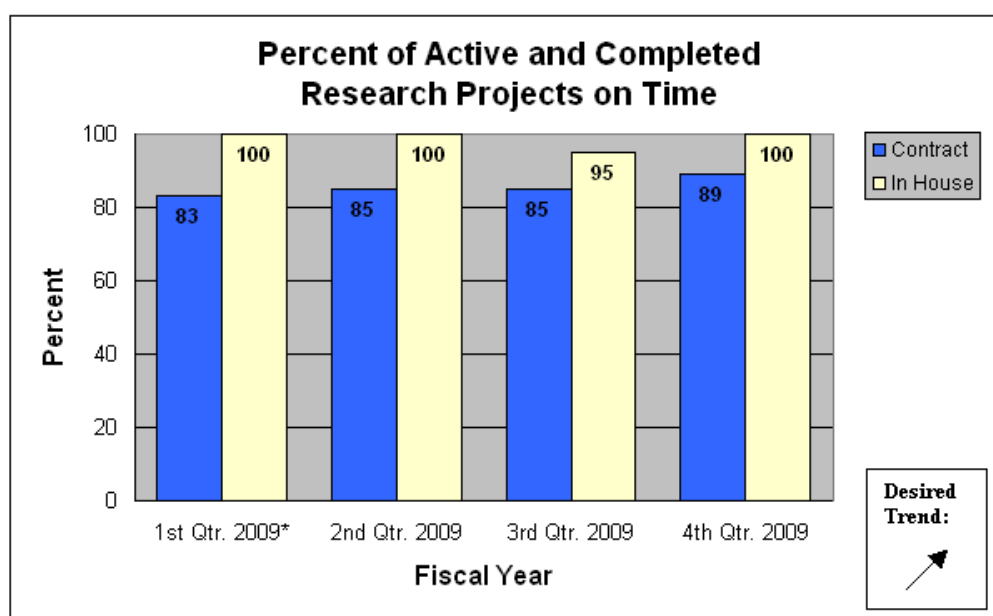
During fiscal year 2009, Organizational Results Division realized a 9.91 percent budget deficit or \$356,552. Administration expenditures were inflated due to an internal coding error on several research invoices. The coding error has been corrected and quarterly SPR budget reporting should further ensure budget accuracy.

## Number of Research Projects Completed



A total of thirty projects were completed during fiscal year 2009, consisting of twenty-one research contracts and nine in-house projects. This is down slightly from FY 2008.

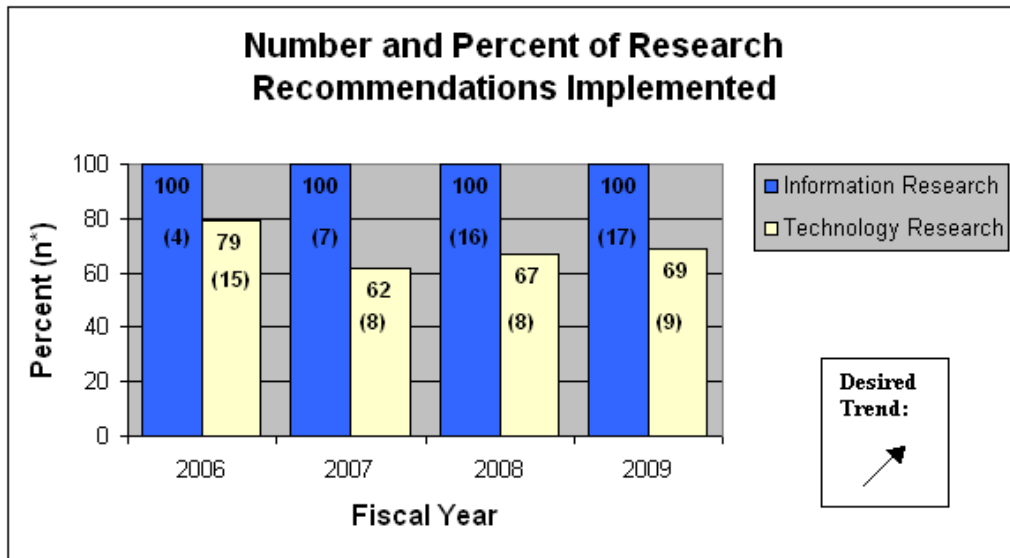
## Percent of Contracted Research Projects On Time



Starting with the first quarter of fiscal year 2009, OR began measuring the percent of research projects on time to include in-house and contract research, both active and completed. Trend data will be added during the next fiscal year.



## Number and Percent of Research Recommendations Implemented



\*(n) Indicates the number of research recommendations implemented

During fiscal year 2009, MoDOT's research program completed 30 total research projects. Seventeen projects were categorized as information and policy guidance reports and are considered implemented. Thirteen projects were categorized as technical, product-focused reports. Nine of those projects produced implemented results within the department. This represents a 69 percent implementation rate for the technical report recommendations.

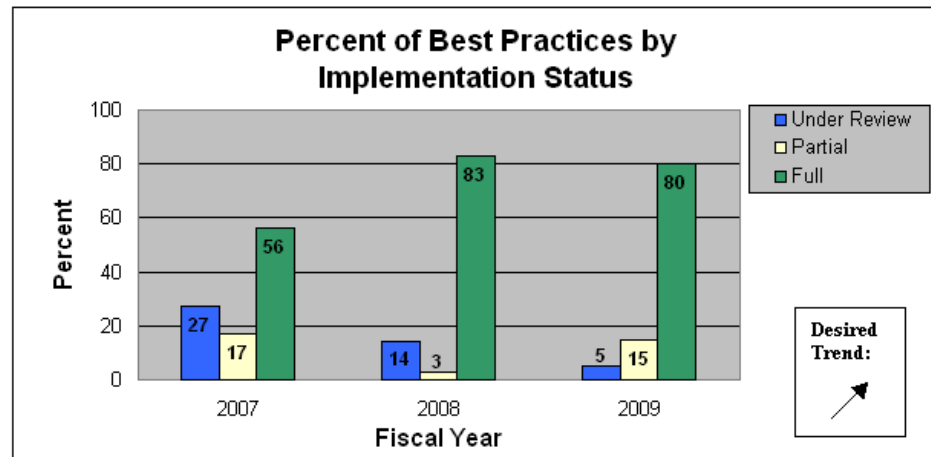
Organizational Results has made a more concerted effort to develop research project work plans that have an implementation element included. This is for both in-house and contract research. Request for proposals (RFPs) for contract research are now required to include implementation as one of the deliverables for each project. This focus leads to more usable solutions and better value. While not all research results or solutions can be implemented, MoDOT recognizes the importance and value of conducting a research program driven to make a difference. Within the last year, Organizational Results has implemented a project-tracking tool, which has brought a better mechanism to track the progress of projects and their implementation.

## Percent of Best Practices by Implementation Status

During fiscal year 2009, MoDOT's Solutions at Work has verified and shared 10 best practices with department employees. Seven of those best practices have been shared within the past 30 days and will be reported in the next survey cycle in January 2010. Similarly six best practices from FY 2008 are included in this survey cycle. Overall, 80 percent of the best practices have been fully implemented with 15 percent partially implemented and 5 percent still under review. With 95 percent of best practices partially or fully implemented, MoDOT is aggressively taking advantage of best practices. The 15 percent partially implemented is primarily due to a delay in securing a fabrication contract on two of the items. The implementation rate for the fiscal year is nearly the same as the previous year with a significant reduction in the percent of best practices still being reviewed. This is a clear indication that

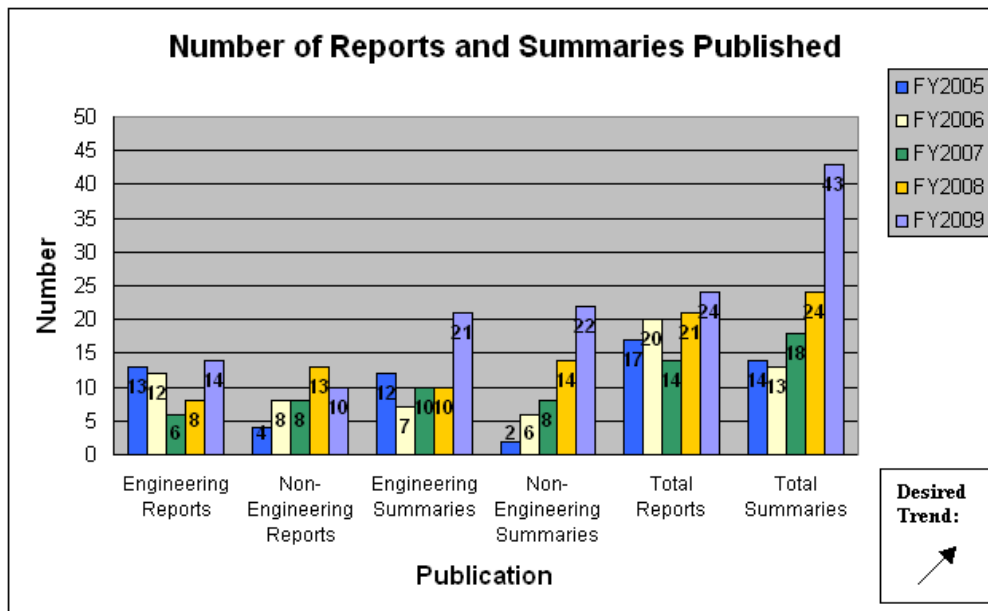
implementation of approved best practices has become a priority. Monthly statewide videoconferences to discuss evaluations and implementation issues should continue to drive implementation numbers upward. While many of these 10 best practices are tools

and equipment modifications to make work faster and safer, some actual savings were realized. Most notably the department saved more than \$2 million through a process to modify low-water crossings and bank the stream mitigation credits for other projects.



## Number of Reports and Summaries Published

The total number of published reports during fiscal year 2009 was 24, which represents an all-time high for MoDOT research. The number of staff summaries published also grew to 43, which is a 79 percent increase from the total for FY 2008. These increases are attributable to multiple publications being prepared from individual research projects and new publications to support innovation. During FY 2009, the average cycle time for reports was slightly more than one and a half hours with an average elapsed time of slightly less than four hours. The average cycle time for staff summaries was slightly more than one and a half hours with an average elapsed time of slightly less than four hours. Community Relations, Construction and Materials and Maintenance accounted for more than half of the total number of publications for during FY 2009.





PO Box 270  
Jefferson City, MO 65102  
573.526.4335  
[innovation@modot.mo.gov](mailto:innovation@modot.mo.gov)